The elevation angle to an ACTS satellite which we use is 30 degrees (Paragraph 4.3.1 of Reference 1, page 8-13 (A-13). Thus we use an antenna gain of -10 dBi which is based on this elevation angle. The LMDS cell diameter (New York City) is 7.8

4.4 INTERFERENCE LINK BUDGET

Calculation of free space loss (FSL).

$$FSL^* = 36.58 + 20Log24{,}009 + 20Log27{,}500$$
$$= 36.58 \quad 87.61 \quad + 88.78$$
$$= 212.97 \text{ dB}$$

EIRP (Interference)	-61.27 dBW/Hz
FSL	-212.97 dB
Polarization Loss	-0.5 dB
Atmospheric absorption	-0.4 dB
Isotropic receive level	-275.14 dBW/Hz
Satellite ant. gain	53.1 dB
RSL (interference)	-222.04 dBW/Hz

*The free space loss (FSL) equation uses the lowest frequency in the band of interest for worst case scenario. The range to the satellite is a function of the 30° elevation angle. The range value comes from Ref. 4.

5. RESULTS

The satellite transponder noise floor is -198.96 dBW/Hz. The interference receive signal level (RSL) is -222.04 dBW/Hz. Then:

$$I_o/N_o = -222.04 \text{ dBW/Hz} - (-198.96 \text{ dBW/Hz}) = -23.08 \text{ dB}.$$

According to Reference 1, the minimum I_o/N_o is -10 dB. The LMDS system has a 13.08 dB margin over this number.

LMDS does not interfere with the ACTS satellite on this worst-case transponder and scenario. It causes only a 0.5% increase in noise. This is well inside their own criteria for I_o/N_o.

6. DISCUSSION

We stated that the LMDS signals add coherently. They do not; they are independent emitters. Thus the total aggregate EIRP of 472 emitters is less than the value given.

It should be noted that we did not take into account the polarization coupling loss on the satellite receive antenna. The LMDS uses linear polarization; we believe the ACTS satellite uses circular. If this is true, there is an additional 3 dB loss coupling the LMDS linear polarized signal into a circular polarized antenna. If the satellite is linear, there will be nearly a 3-dB protection, because half the LMDS emitters are on orthogonal polarizations to the other half.

In addition, LMDS emitters near beam edge will contribute less power to the total, as shown, due to the fact that the satellite beam is a 3-dB contour. This will correspond to still another ~1.5 dB of protection.

It should also be noted, that if we were to increase our coverage area to encompass more LMDS transmitters, the satellite antenna gain must decrease to corrrespondingly increase antenna beamwidth. By doubling the area, we approximately double the beamwidth resulting in a drop of 3 dB in the antenna gain corresponding to a 3 dB drop in interference level.

The final comment paragraph 4.3.1 of Reference 1 seems poorly thought out. If the longitude of ACTS is 100 degrees west, we doubt much activity under 30 degrees elevation angle in the contiguous 48 states.

Prepared and submitted by:

Roger L. Freeman

Roger L. Freeman, Principal
Roger Freeman Associates

REFERENCES

1. "Sharing between Local Multipoint Distribution Service and Other Services in the 27.5 - 29.5 GHz Band," prepared by ARC Professional Services Group, C³I Systems Division under contract to the National Aeronautics and Space Administration. (no date)

2. "The Sarnoff Report," David Sarnoff Laboratories, Princeton, NJ (no date).

3. Andrew Corporation Antenna Radiation Pattern. enclosure to Andrew Letter to B. Bossard dated April 4, 1993.

4. Roger L. Freeman, "Telecommunication Transmission Handbook," 3rd ed., John Wiley & Sons, NY 1991.

APPENDIX 5

RESUME OF
ROGER L. FREEMAN

RESUME

Roger L. Freeman

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OBJECTIVE: Technically challenging short and medium-term positions as an independent telecommunication consultant.

EXPERIENCE SUMMARY

Over 25 years experience in complex telecommunication system design and operation. Engineered and managed:

- digital telephone networks - data/integrated networks
- digital switching and transmission - routing and signaling
- telecommunications planning - outside/inside plant
- transmission techniques include:

- LOS microwave	- satellite systems	- fiber optics
- wire-pair	- coaxial cable	- troposcatter
- HF	- meteor burst	- VHF/UHF mobile

International experience:

- Europe and Hispanic America
- International agencies such as CCITT/CCIR/ITU
- InterAmerican Development Bank - PTTs

Secret clearance, previously top secret.

SPECIFIC BACKGROUND

7/78 to Present: Raytheon Company, Communication Systems Directorate, Marlborough, MA.
Principal Engineer, Advanced System Planning. Responsible for new business development for advanced military communication systems.

- Adapted advanced commercial telecommunication practice to the military environment.
- Prepared corporate position papers on technical issues such as:
  - commercial satellite communications for military application
  - BISDN/ATM in the tactical environment
  - OC-1 and OC-3 over millimeter wave radio
  - MBC system experiments for the U.S. Army
- Advised other Raytheon divisions/directorates on commercial telecommunication practice such as Nexrad and Ramp communication systems.

4/70 to 7/78: ITT Laboratories, Spain (Madrid)
Staff consultant, telecommunication planning. Advised on transmission and signaling planning.

- Prepared/published ITT's "Telecommunication Planning Guides."
- Managed planning projects in Hispanic America and Europe.
- Formulated ITT standard: "Transmission Factors in Switching."
- Managed ITT Marine (technical) for three years - saw 50% increase in GOR

PRIOR EXPERIENCE

Page Communications Engineers, Washington, D.C. Staff engineer for Hispanic American programs.

International Telecommunication Union (Geneva) Regional Planning Expert for northern South America based in Quito, Ecuador.

ITT Communication Systems - member of technical staff, military